

Listing of Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (currently amended) A process for forming a barrier film to prevent poisoning a photoresist material used in forming a semiconductor device, comprising:

depositing a first barrier layer containing silicon carbide and nitrogen directly on a layer having an interconnect conductor;

depositing a nitrogen-free second barrier layer directly on top of the first barrier layer, wherein the second barrier layer comprises nitrogen-free silicon carbide;

forming a first low-k dielectric layer over the second barrier layer; and

depositing a photoresist material to form a photoresist layer above at least a portion of the first low-k dielectric layer;

prior to depositing said photoresist material, forming an etch stop layer on top of the second barrier layer and forming a second low-k dielectric layer on top of the etch stop layer;

patterning the photoresist layer to form a photoresist mask over the second low-k dielectric layer where a trench is to be formed;

forming the trench in the second low-k dielectric layer by etching using the photoresist mask;

forming and patterning a second photoresist layer to form a second photoresist mask over the second dielectric layer and the trench; and

forming a via in the first dielectric layer by etching to complete a dual damascene structure.

2-3. (canceled)

4. (currently amended) The process of claim 1 ~~claim 3~~, wherein the process tool used to deposit the first barrier layer is used to deposit the nitrogen-free second barrier layer.

5. (original) The process of claim 1, wherein depositing a first barrier layer containing silicon carbide and nitrogen comprises using a PECVD process and one of NH₃, N₂, and N₂O as a chemical precursor to supply the nitrogen.

6. (original) The process of claim 5, wherein depositing a nitrogen-free second barrier layer comprises using the PECVD process recited in claim 5 and turning off the supply of nitrogen.

7. (previously presented) A process for forming a barrier film to prevent poisoning a photoresist material used in forming a semiconductor device, comprising:

depositing a first barrier layer containing silicon carbide and nitrogen on a surface located to control electrical leakage from a conductor;

depositing a nitrogen-free second barrier layer directly on top of the first barrier layer, wherein the nitrogen free second barrier layer is a silicon carbide layer;

forming a first low-k dielectric layer over the second barrier layer;

forming an etch stop layer on top of the second barrier layer and forming a second low-k dielectric layer on top of the etch stop layer;

after forming the second low-k dielectric layer, depositing a photoresist material to form a photoresist layer above at least a portion of the first low-k dielectric layer;

patterning the photoresist layer to form a photoresist mask over the second low-k dielectric layer where a via is to be formed;

forming the via by etching through the second low-k dielectric layer, the etch stop layer, and the first low-k dielectric layer using the photoresist mask;

removing the photoresist mask;

forming and patterning a second photoresist layer to form a second photoresist mask over the second low-k dielectric layer where a trench is to be formed; and

forming a trench in the second low-k dielectric layer by etching using the second photoresist mask to complete a dual damascene structure.

8. (previously presented) The process of claim 7, wherein the nitrogen-free silicon carbide barrier layer is formed by injecting an SiH_x(CH₃)_y gas, where x is chosen in the range of 0 to 3, and x+y = 4.

9. (canceled)

10. (currently amended) The process of claim 1 ~~claim 9~~, wherein the nitrogen-free silicon carbide barrier layer is formed by injecting an $\text{SiH}_x(\text{CH}_3)_y$ gas, where x is chosen in the range of 0 to 3, and $x+y = 4$.

11. (currently amended) The process of claim 10 ~~claim 9~~, wherein depositing a first barrier layer containing silicon carbide and nitrogen comprises using a PECVD process and one of NH_3 , N_2 , and N_2O as a chemical precursor to supply the nitrogen.

12. (currently amended) A process for forming a barrier film to prevent poisoning a photoresist material used in forming a semiconductor device, comprising:

depositing a first barrier layer containing silicon carbide and nitrogen directly on a layer having an interconnect conductor;

depositing a nitrogen-free second barrier layer directly on top of the first barrier layer, wherein the second barrier layer comprises nitrogen-free silicon carbide;

forming a first low-k dielectric layer over the second barrier layer;

depositing a photoresist material to form a photoresist layer above at least a portion of the first low-k dielectric layer; The process of claim 3, further comprising:

prior to depositing said photoresist material, forming an etch stop layer on top of the second barrier layer

patterning the photoresist layer to form a photoresist mask over the etch stop layer where a via is to be formed;

forming a via mask by etching through the etch stop layer;

removing the photoresist mask;

depositing a second low-k dielectric layer on top of the via mask;

forming and patterning a second photoresist layer to form a second photoresist mask over the second low-k dielectric layer where a trench is to be formed; and

forming a trench and via by etching through the second and first low-k dielectric layers in one process step to complete a dual damascene structure.

13. (original) The process of claim 12, wherein depositing a first barrier layer containing silicon carbide and nitrogen comprises using a PECVD process and one of NH₃, N₂, and N₂O as a chemical precursor to supply the nitrogen.

14. (previously presented) The process of claim 12, wherein the nitrogen-free silicon carbide barrier layer is formed by injecting an SiH_x(CH₃)_y gas, where x is chosen in the range of 0 to 3, and x+y = 4.

15-20. (canceled)

21. (previously presented) The process of claim 1, wherein the thickness of the second barrier layer is approximately 25 % of the thickness of the first barrier layer.

22. (previously presented) The process of claim 1, wherein the nitrogen free second barrier layer is formed immediately after the first barrier layer by using the same chemical precursors used in forming the first barrier layer except for the chemical precursors used to supply the nitrogen for the first barrier layer.

23-24. (canceled)